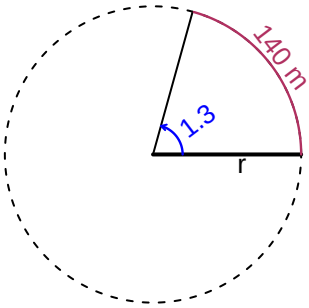
Name: Date:

## Trig Final (Solution v9)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.3 radians. The arc length is 140 meters. How long is the radius in meters?

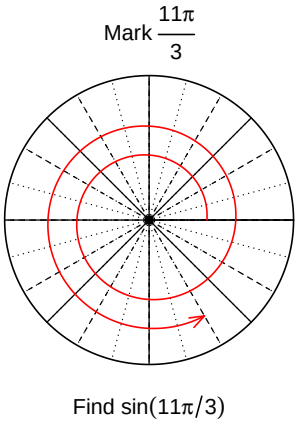



$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

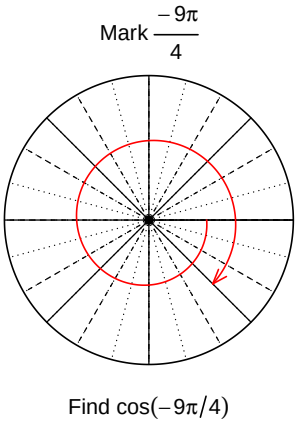
$r = 107.7$ meters.

### Question 2

Consider angles $\frac{11\pi}{3}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{11\pi}{3}\right)$ and $\cos\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).




Find $\sin(11\pi/3)$




Find $\cos(-9\pi/4)$

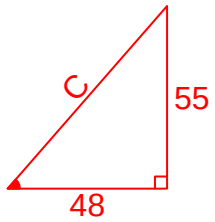
$\sin(11\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$

**Question 3**

If $\tan(\theta) = \frac{55}{48}$, and $\theta$ is in quadrant III, determine an exact value for $\sin(\theta)$.

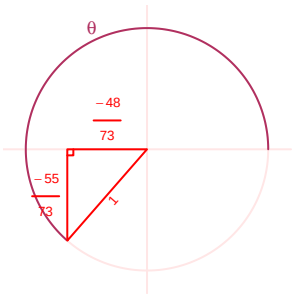
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.




Solve the Pythagorean Equation

$$48^2 + 55^2 = C^2$$
$$C = \sqrt{48^2 + 55^2}$$
$$C = 73$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.




$$\sin(\theta) = \frac{-55}{73}$$

**Question 4**

A mass-spring system oscillates vertically with a frequency of 3.02 Hz, a midline at $y = -7.23$ meters, and an amplitude of 5.24 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height ($y$ in meters) as a function of time ($t$ in seconds).

Any of these equations would get full credit.

$$y = 5.24\cos(2\pi 3.02t) - 7.23$$

or

$$y = 5.24\cos(6.04\pi t) - 7.23$$

or

$$y = 5.24\cos(18.98t) - 7.23$$